

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

The Impact of Optimum Dosages of Mineral in Various Combination on Larval Development and Silk Production of *Bombyx mori* L.

Muhammad Ashfaq, M.A. Rehman and Amjad Ali¹

Department of Entomology, University of Agriculture, Faisalabad, Pakistan

¹Entomological Research Sub-station, Bahawalpur, Pakistan

Abstract: Optimum elements dosages i.e., 0.2%, 0.3%, 0.1%, 0.1%, 0.15% and 0.5% of various minerals i.e., N, P, K, Ca, Mg and Cu respectively in various combinations were studied on larval development and silk production of *Bombyx mori* L. The rearing of silkworm larvae was restricted to chopped tender and green mulberry leaves treated with different concentrations. The results revealed that mineral nutrients have not affected the yield component significantly but have also presented better food consumption, body weight, co-efficient of utilization and larval development as well. However, of all the test treatments T11 where the offered mulberry leaves were treated with 0.2% N + 0.3% K + 0.1% Ca + 0.1% P + 0.15% Mg + 0.5% Cu concentration gave the best results.

Key words: Mineral supplements, mulberry leaves, silkworm, Pakistan

Introduction

Sericulture is one of the major labour intensive cottage industry, capable of significant contribution towards easing the problems of unemployment and improving the socio-economic status of the rural masses.

Recently fundamental and applied researchers are concentrating rearing of silkworm on mulberry leaves supplemented with different chemical substances.

El-Karaksy and Idriss (1990) invested that fifth instar larvae of silkworm fed on mulberry leaves treated with ascorbic acid produced heavier cocoon.

Kubota *et al.* (1990) reported that silkworm larvae ingest and digest more of the artificial diet with reasonable amount of minerals. Javaid (1991) reported that mineral nutrients affect not only yield components significantly, but also food consumption, co-efficient of utilization and larval development. He concluded that mulberry leaves treated with 0.3% K + 0.2% N concentrations gave the best results. Maqbool (1991) concluded that 0.1% calcium gave the best results regarding development and cocoon weight. Ishtiaq and Akhtar (1992) found that larval feeding on 0.2% N + 0.1% Ca + 0.1% K treated leaves was more rapid but the co-efficient of utilization was the minimum, however, the larval size, larval and cocoon weight and silk production was increased. Ahmad (1993) concluded that mulberry leaves treated with 0.2% N + 0.1% P + 0.1% K solutions, gave the best results. Hussain (1993) reported that mulberry leaves treated with 0.5% Ca + 0.1% N solution showed statistically better food consumption, co-efficient of utilization, larval length, larval body weight, and cocoon weight with and without pupa than those fed on simple mulberry leaves. Ishtiaq (1993) concluded that feeding of mulberry leaves supplemented with 0.2% N + 0.1% Ca + 0.1% K proved the best possible dose for silkworm rearing. The present project is proposed to treat mulberry leaves with optimum dosages of N, P, K, Mg, Ca and Cu in various combinations with an ultimate aim of promoting the quality of silk.

Materials and Methods

The imported silkworm eggs were purchased from Inspector Forest Department, Faisalabad. They were placed in an incubator, at an ambient temperature of 14-27°C and

relative humidity of 75-80% in Sericulture Laboratory, Department of Agricultural Entomology, University of Agriculture, Faisalabad, for hatching. The newly hatched silkworms larvae were separated from stock culture and divided into 36 subgroups of 50 larvae each and subjected to the following treatments.

- | | |
|-----|---|
| T0 | = Simple mulberry leaves |
| T1 | = Mulberry leaves dipped in distilled water |
| T2 | = Mulberry leaves dipped in 0.2% N + 0.3% K + 0.15% Mg + 0.05% Cu |
| T3 | = Mulberry leaves dipped in 0.2% N + 0.1% P + 0.15% Mg + 0.05% Cu |
| T4 | = Mulberry leaves dipped in 0.3% K + 0.1% Ca + 0.15% Mg + 0.05% Cu |
| T5 | = Mulberry leaves dipped in 0.3% K + 0.1% Ca + 0.15% Mg + 0.05% Cu |
| T6 | = Mulberry leaves dipped in 0.2% N + 0.1% P + 0.15% Mg + 0.05% Cu |
| T7 | = Mulberry leaves dipped in 0.1% Ca + 0.1% P + 0.15% Mg + 0.05% Cu |
| T8 | = Mulberry leaves dipped in 0.2% N + 0.3% K + 0.1% P + 0.15% Mg + 0.05% Cu |
| T9 | = Mulberry leaves dipped in 0.2% N + 0.3% K + 0.1% P + 0.15% Mg + 0.05% Cu + 0.16% Ca |
| T10 | = Mulberry leaves dipped in 0.3% K + 0.1% Ca + 0.1% P + 0.15% Mg + 0.05% Cu |
| T11 | = Mulberry leaves dipped in 0.2% N + 0.3% K + 0.1% Ca + 0.1% P + 0.15% Mg + 0.05% Cu |

Each treatment was replicated three times. The larvae were reared in 12 × 9 inch cardboard trays, separately. The first two instars of silkworm larvae of each treatment were fed chopped treated leaves of *Morus alba* i.e. plucked and dipped in various concentrations of different mineral nutrients and fed to the larvae of respective treatments after drying under shade. The later three instars were fed on full grown green, tender, treated leaves. The larvae were fed four times a day at almost equal intervals starting 6 a.m. to 12.00 p.m. Feeding was continued except the moulting intervals, till the larvae became full fed. With the development and growth of larvae, they were screened and finally a lot of 10 larvae in the replication of each treatment

Ashfaq *et al.*: Larval development, silk production

Table 1: Food consumption, coefficient of utilization and various yield parameters as affected by different treatments in *Bombyx mori* L.

Treatments	Food consumption (gms/10 Larvae)	Coefficient of Utilization (%)	Body weight 10 Larvae (gms)	Larval length 10 Larvae (cm)	Cocoon weight without pupa (gms)	Cocoon weight with Pupa (gms)
T0	41.36F	52.22F	40.03G	6.01K	0.2327D	1.01J
T1	46.67E	56.78E	40.33G	6.13J	0.2623C	1.12H
T2	53.10AB	63.50D	41.03F	6.23I	0.2987B	1.14GH
T3	52.57AB	63.09D	42.80D	6.32H	0.2623C	1.16F
T4	51.70BC	63.98CD	40.96F	6.40G	0.2263D	1.05I
T5	48.68DE	65.81C	42.66DE	7.02E	0.3057B	1.26C
T6	49.41CD	66.56C	42.05E	6.52F	0.2497C	1.24B
T7	47.23DE	65.45CD	42.56DE	7.12D	0.0233E	1.15FG
T8	52.27AB	72.07AB	43.89BC	7.23C	0.2650C	1.19E
T9	53.81AB	73.98A	44.38B	7.46B	0.2900B	1.29B
T10	52.81AB	70.85B	43.64C	6.46FG	0.2903B	1.28BC
T11	54.60A	74.55A	45.33A	7.65A	0.3113A	1.38A

was maintained. All operations were carried out in Complete Randomized Design. The data on consumption, dry faeces, body weight, larval length and cocoon weight with and without pupa were recorded. Coefficient of Utilization was determined by the following formula.

$$\text{Coefficient of Utilization (\%)} = \frac{\text{Dry weight of food consumed} - \text{Dry weight of faeces}}{\text{Dry weight of food consumed}} \times 100$$

The data were analysed statistically.

Results and Discussion

The results (Table 1) reveal significant differences among treatments regarding food consumption, co-efficient of utilization (CU), larval body weight and length, cocoon weight with pupa and without pupa. The maximum food consumption was recorded to be 54.60 gms in T11 which was statistically at par with those of recorded in T10, T9, T8, T3 and T2 with 52.81, 53.81, 52.27, 52.57 and 53.10 gms., respectively. The treatment where simple mulberry leaves were fed by silkworm larvae resulting in minimum food consumption i.e. 41.36 gms. which differed significantly from all the treatments.

The maximum CU was recorded in T11 with 74.55% CU which did not differ significantly from those of 73.98 and 72.07% in T9 and T8, respectively. The minimum co-efficient of utilization figure was 52.22% in T0. All the other treatments showed similar trend statistically and were intermediate. The larval body weight per 10 larvae was maximum (45.33 gms) in T11 which differed significantly from all other treatments. The minimum body weight was recorded to be 40.03 in T0 which did not differ significantly from 40.33 gms in T1. Other treatments showed more or less intermediate trend.

The maximum larval length, cocoon weight with pupa and without pupa were recorded to be 7.65 cm, 1.38 gms and 0.3113 gms, in T11 which differed significantly from all other treatments, whereas these were minimum i.e. 6.01 cm, 1.01 gms, 0.2327 gms in T0, respectively. It was concluded that the treatment T11 where the offered mulberry leaves were treated with 0.2% N + 0.3% K + 0.1% Ca + 0.1% P + 0.15% Mg + 0.5% Cu concentration presented not only better food consumption, body weight, CU and larval development but also affected

the yield components significantly. The present findings can partially be compared with those of El-Karaksy and Idriss (1990) who reported that fifth instar larval of silkworm fed on mulberry leaves treated with ascorbic acid produced heavier cocoon.

The present findings are in line with those of Kubota *et al.* (1990), Javaid (1991), Maqbool (1991), Ishtiaq and Akhtar (1992), Ahmad (1993), Hussain (1993) and Ishtiaq (1993) who fed silk worm larvae on artificial diet and got satisfactory results.

References

- Ahmad, Z., 1993. Effect of nitrogen and phosphorus treated mulberry leaves on larval development and silk yield of *Bombyx mori* L. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan.
- El-Karaksy, I.A. and M. Idriss, 1990. Ascorbic acid enhances the silk yield of the mulberry silkworm *Bombyx mori* L. J. Applied Entomol., 109: 81-86.
- Hussain, A., 1993. Impact of feeding calcium and nitrogen treated mulberry leaves on the development of silkworm, *Bombyx mori* L. and silk yield. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan.
- Ishtiaq, A. and M. Akhtar, 1992. Effect of feeding Nitrogen, Calcium and Potassium treated mulberry leaves on the larval development and silk yield of silkworm, *Bombyx mori* L. Pak. Entomol., 14: 74-76.
- Ishtiaq, A., 1993. Effect of nitrogen, calcium and potassium treated mulberry leaves on the larval development and silk yield of *Bombyx mori* L. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan.
- Javaid, M.A., 1991. Effect of treated mulberry leaves with mineral supplements (N.K.) on the development of silkworm and silk yield. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan.
- Kubota, T., T. Ohtsuka and H. Yanagawa, 1990. Effective rearing methods for polyphagous silkworm strains in fourth instar larvae by using low cost artificial diet. J. Sericult. Sci. Jap., 59: 336-340.
- Maqbool, S., 1991. Effect of feeding calcium and nitrogen treated mulberry leaves on larval development and silk yield of *Bombyx mori* L. M.Sc. Thesis, University of Agriculture, Faisalabad, Pakistan.